

## Claims

- [c1] 1. A wire comprising a sheath encapsulating a core having a core composition, the core composition comprising a combination of graphite and a compound of potassium, the combination of graphite and the compound of potassium in the core composition not exceeding approximately 5% by weight, the wire capable of being used in an alternating current welding process without destabilizing a welding arc.
- [c2] 2. The wire of Claim 1, wherein the compound of potassium is  $K_2 MnTiO_4$ .
- [c3] 3. The wire of Claim 1, wherein the combination of graphite and the compound of potassium in the core composition is selected from the range of about 0.3% to about 5% by weight.
- [c4] 4. The wire of Claim 1, wherein the diameter of the wire does not exceed 3/32".
- [c5] 5. The wire of Claim 4, wherein the alternating current does not exceed 1000A at and the amplitude of an electron negative cycle reaches about 850–900 A.
- [c6] 6. The wire of Claim 1, wherein the diameter of the wire is about 5/32".
- [c7] 7. The wire of Claim 6, wherein the alternating current does not exceed 1750A at and the frequency is between 160Hz and 180 Hz.
- [c8] 8. The wire of Claim 1, wherein the wire composition comprises
- [t1]

C	Mn	Si	Ni	P	S
0.06–0.07	1.1–1.28	0.5–0.65	1.0	0.011	0.011
0.06–0.07	1.1–1.35	0.5–0.70	1.0	0.011	0.010

- [c9] 9. The wire of Claim 8 having the tensile strength which does not exceed 90,000 psi.
- [c10] 10. The wire of Claim 1, wherein the core composition further comprises a percentage of Ni selected from the range from about 0%wt to about 4 %wt..

- [c11] 11. An alternating current welding apparatus comprising:  
 a welding gun having means for feeding an electrode into the welding gun;  
 the electrode comprising a sheath encapsulating a core having a core composition, the core composition comprising a combination of graphite and a compound of potassium, the combination of graphite and the compound of potassium in the core composition not exceeding approximately 5% by weight;  
 and  
 a power source supplying alternating electrical current to the electrode.
- [c12] 12. The alternating current welding apparatus of Claim 11, further comprising a gas source supplying a shielding gas to the welding apparatus.
- [c13] 13. The alternating current welding apparatus of Claim 11, wherein the welding process is gas metal arc welding.
- [c14] 14. The alternating current welding apparatus of Claim 11, wherein the means for feeding the electrode into the welding gun comprise a wire drive and a wire reel.
- [c15] 15. The alternating current welding apparatus of Claim 11, wherein the compound of potassium is  $K_2 MnTiO_4$ .
- Sub  
A* [c16] 16. The alternating current welding apparatus of Claim 15, wherein the combination is selected from the range from about 0.3% to about 5.0%.
- [c17] 17. The alternating current welding apparatus of Claim 12, wherein the shielding gas comprises a mixture of Ar and  $CO_2$ .
- [c18] 18. The alternating current welding apparatus of Claim 11, wherein the alternating current does not exceed 1000A at and the amplitude of an electron negative cycle reaches about 850–900 A.
- [c19] 19. The alternating current welding apparatus of Claim 11, wherein the diameter of the wire does not exceed about 5/32".
- [c20] 20. A alternating current welding process comprising:  
 providing an alternating current welding apparatus having means for feeding an

electrode into the welding apparatus and means for supplying a shielding gas into the welding apparatus;  
 coupling the alternating current welding apparatus to an alternating current power source and forming an arc;  
 feeding the electrode into the alternating current welding apparatus, the electrode comprising a sheath and a core having a core composition, the core composition comprising a combination of graphite and a compound of potassium, the combination of graphite and the compound of potassium in the core composition not exceeding approximately 5% by weight; and  
 supplying the shielding gas into the alternating current welding apparatus to shield the electrode and the arc.

- [c21] 21.The welding process of Claim 20, wherein supplying the shielding gas into the alternating current welding apparatus comprises providing an external gas source.
- [c22] 22. The welding process of Claim 20, wherein feeding the electrode into the alternating current welding apparatus comprises providing means for feeding the electrode that is external to the welding apparatus.
- [c23] 23.The welding process of Claim 20, wherein supplying the shielding gas comprises providing a mixture of Ar and  $\text{CO}_2$ .
- [c24] 24.The welding process of Claim 20, wherein the welding process is a gas metal arc welding process.
- [c25] 25.The welding process of Claim 20, wherein the compound of potassium is  $\text{K}_2\text{MnTiO}_4$ .
- Sub A* [c26] 26.The welding process of Claim 25, wherein the combination is selected from the range from about 0.3% to about 5.0%.
- [c27] 27.The welding process of Claim 20, wherein the alternation current does not exceed 1000A and wherein the amplitude of an electrode negative part of the cycle reaches about 850-900A.
- [c28] 28.The welding process of Claim 20, wherein the electrode comprises a

percentage of Ni selected from the range of about 0%wt to about 4%wt.

- [c29] 29. The welding process of Claim 20, wherein the electrode comprises up to 1% wt of Ni and exhibits a tensile strength of up to 90,000 psi.
- [c30] 30. The welding process of Claim 20, wherein the diameter of the electrode does not exceed  $3/32$ ".
- [c31] 31. The welding process of Claim 20, wherein the diameter of the wire does not exceed  $5/32$ ".